

What is claimed is:

1. An image forming device for forming a multicolor image by superimposing a plurality of monochromatic images on a recording medium, the device comprising:

5 an image carrying member carrying an image;

 a plurality of image forming units, each of the plurality of image forming units forming a monochromatic calibration image on the image carrying member;

 a measuring unit measuring at least one predetermined
10 kind of information with respect to the monochromatic calibration image, thereby obtaining at least one data group of the at least one predetermined kind of information;

 an abnormal-data excluding unit excluding abnormal data from each of the at least one data group, thereby
15 obtaining normal data; and

 a color-registration correcting unit adjusting the plurality of image forming units based on the normal data, thereby correcting color registration errors among a plurality of monochromatic images.

20 2. The image forming device as claimed in claim 1, further comprising a position detecting unit detecting a reference position on the image carrying member and obtaining an image forming position of the monochromatic calibration image on the image carrying member, the image
25 forming position being a relative position with regard to

the reference position.

3. The image forming device as claimed in claim 2, wherein each of the at least one data group includes at least one data element, and

5 wherein the abnormal-data excluding unit includes an abnormal-data determining unit determining whether each of the at least one data element is out of a predetermined range, thereby determining abnormal data.

10 4. The image forming device as claimed in claim 3, wherein the abnormal-data excluding unit further includes an abnormal-position determining unit determining, as an abnormal position, the image forming position of the monochromatic calibration image at which abnormal data has been obtained.

15 5. The image forming device as claimed in claim 4, wherein the abnormal-data excluding unit further includes an abnormal-position storing unit storing positional data of the abnormal position.

20 6. The image forming device as claimed in claim 5, wherein the each of the plurality of image forming units forms the monochromatic calibration image on the image carrying member, while avoiding the abnormal position whose positional data is stored in the abnormal-position storing unit.

25 7. The image forming device as claimed in claim 5,

wherein the measuring unit measures the at least one predetermined kind of information for the monochromatic calibration image, while avoiding the abnormal position whose positional data is stored in the abnormal-position storing unit.

8. The image forming device as claimed in claim 5, further comprising a measurement-data storing unit storing the at least one data element of the at least one data group, wherein the abnormal-data excluding unit further includes an abnormal-data deleting unit deleting, from the at least one data element stored in the measurement-data storing unit, the abnormal data whose positional data is stored in the abnormal-position storing unit, thereby obtaining the normal data.

9. The image forming device as claimed in claim 8, wherein the abnormal-data deleting unit further deleting, from the at least one data element stored in the measurement-data storing unit, the abnormal data which has been determined to be out of the predetermined range by the abnormal-data determining unit.

10. The image forming device as claimed in claim 5, wherein the abnormal-position storing unit is a nonvolatile storage unit.

11. The image forming device as claimed in claim 3, wherein the each of the plurality of image forming units is

provided for each of a plurality of colors;

wherein the color-registration correcting unit includes:

5 a calibration-image generating unit generating a plurality of monochromatic calibration images in each of the plurality of colors and controlling each of the plurality of image forming units to form the plurality of monochromatic calibration images at predetermined intervals; and

10 a normal-data-number determining unit determining whether the abnormal-data excluding unit has obtained at least three normal data of the monochromatic calibration images, the at least three normal data having positional data that are not stored in the abnormal-position storing unit, the at least three normal data having been
15 determined to be in the predetermined range by the abnormal-data determining unit; and

wherein, if the normal-data-number determining unit has determined that a number of the normal data obtained by
20 the abnormal-data excluding unit is less than three, the calibration-image generating unit controls each of the plurality of image forming units to form a plurality of monochromatic calibration images at different positions on the image carrying member, the different positions being
25 different from positions at which the plurality of image

forming units has already formed the plurality of monochromatic calibration images, thereby allowing the color-registration correcting unit to repeat correcting color registration errors.

5 12. The image forming device as claimed in claim 3, wherein the each of the plurality of image forming units is provided for each of a plurality of colors;

 wherein the each of the plurality of image forming units includes an electrostatic-latent-image carrying member
10 having a drum shape with a circumferential surface opposing the image carrying member, the electrostatic-latent-image carrying member carrying an electrostatic latent image formed on the circumferential surface and transferring, to the image carrying member, a developer image formed on the
15 electrostatic latent image, thereby forming a monochromatic image on the image carrying member; and

 wherein the color-registration correcting unit includes:

 a calibration-image generating unit generating
20 a plurality of monochromatic calibration images in each of the plurality of colors and controlling each of the plurality of image forming units to form the plurality of monochromatic calibration images at predetermined intervals;

 a phase determining unit determining a phase
25 of each electrostatic-latent-image carrying member based on

a position of each of the plurality of monochromatic calibration images on the image carrying member detected by the position detecting unit; and

5 a phase control unit controlling each of the plurality of image forming units to correct the color registration errors caused by a difference between the phase of each electrostatic-latent-image carrying member.

13. The image forming device as claimed in claim 12, wherein the each of the plurality of image forming units
10 further includes a driving unit driving the electrostatic-latent-image carrying member to rotate; and

wherein the phase control unit includes a drive control unit controlling each driving unit to drive each electrostatic-latent-image carrying member to rotate,
15 allowing the phase of each electrostatic-latent-image carrying member to be identical with each other.

14. The image forming device as claimed in claim 12, wherein the each of the plurality of image forming units further includes an exposure unit exposing the
20 circumferential surface of the electrostatic-latent-image carrying member; and

wherein the phase control unit includes an exposure-timing control unit controlling exposure timing at which each exposure unit exposes the circumferential surface of
25 the electrostatic-latent-image carrying member.

15. The image forming device as claimed in claim 12,
wherein the calibration-image generating unit controls the
each of the plurality of image forming units to form the
plurality of monochromatic calibration images over at least
5 a half-cycle length of a circumference of the electrostatic-
latent-image carrying member.

16. The image forming device as claimed in claim 3,
wherein the each of the at least one data group includes at
least three data elements.

10 17. The image forming device as claimed in claim 1,
wherein the at least one predetermined kind of information
includes density of the monochromatic calibration image;

wherein the measuring unit includes a density
measuring unit measuring the density of the monochromatic
15 calibration image, thereby obtaining density data; and

wherein the color-registration correcting unit adjusts
each of the plurality of image forming units based on the
density data of the monochromatic calibration image.

18. The image forming device as claimed in claim 1,
20 wherein the at least one predetermined kind of information
includes a position of the monochromatic calibration image;

wherein the each of the plurality of image forming
units is provided for each of a plurality of colors;

wherein the measuring unit includes a calibration-
25 image-position measuring unit measuring the position of the

monochromatic calibration image; and

wherein the color-registration correcting unit adjusts the plurality of image forming units for aligning positions at which each of the plurality of image forming units forms
5 a monochromatic image, thereby obtaining monochromatic images in the plurality of colors that are aligned with each other.

19. The image forming device as claimed in claim 1, wherein the image carrying member is a conveying belt for
10 conveying the recording medium. .

20. An image forming device for forming a multicolor image by superimposing a plurality of monochromatic images on a recording medium, the device comprising:

an image carrying member carrying an image;

15 a plurality of image forming units, each of the plurality of image forming units forming a monochromatic calibration image on the image carrying member;

a measuring unit measuring at least one predetermined kind of information with respect to the monochromatic
20 calibration image, thereby obtaining measurement data of the monochromatic calibration image;

an abnormal-position storing unit storing positional data of a position at which the measurement data is abnormal; and

25 a color-registration correcting unit adjusting the

plurality of image forming units based on the measurement data whose positional data is not stored in the abnormal-position storing unit, thereby correcting color registration errors among a plurality of monochromatic images.

5 21. An image forming device for forming a multicolor image by superimposing a plurality of monochromatic images on a recording medium, the device comprising:

 an image carrying member carrying an image;

 a plurality of image forming units, each of the
10 plurality of image forming units forming a monochromatic calibration image on the image carrying member;

 a measuring unit measuring at least one predetermined kind of information with respect to the monochromatic calibration image, thereby obtaining measurement data of the
15 monochromatic calibration image;

 a measurement-data determining unit determining whether the measurement data is either normal data or abnormal data; and

 a color-registration correcting unit adjusting the
20 plurality of image forming units based on the normal data by excluding the abnormal data, thereby correcting color registration errors among a plurality of monochromatic images.

 22. An image forming device for forming a multicolor
25 image by superimposing a plurality of monochromatic images

on a recording medium, the device comprising:

an image carrying member carrying an image;

a plurality of image forming units, each of the
plurality of image forming units forming a monochromatic
5 calibration image on the image carrying member;

a position detecting unit detecting a position of the
monochromatic calibration image on the image carrying
member;

a measuring unit measuring at least one predetermined
10 kind of information with respect to the monochromatic
calibration image, thereby obtaining measurement data of the
monochromatic calibration image;

a measurement-data determining unit determining
whether the measurement data is either normal data or
15 abnormal data; and

an abnormal-position storing unit storing positional
data of the position of the monochromatic calibration image
at which the measurement-data determining unit has
determined that the measurement data is the abnormal data.

20 23. An image forming device for forming a multicolor
image by superimposing a plurality of monochromatic images
on a recording medium, the device comprising:

an image carrying member carrying an image;

an abnormal-position storing unit storing positional
25 data of a position at which measurement data of a

monochromatic calibration image on the image carrying member is abnormal;

5 a plurality of image forming units, each of the plurality of image forming units forming the monochromatic calibration image on the image carrying member, while avoiding the position whose positional data is stored in the abnormal-position storing unit;

10 a measuring unit measuring at least one predetermined kind of information with respect to the monochromatic calibration image, thereby obtaining the measurement data of the monochromatic calibration image; and

15 a color-registration correcting unit adjusting the plurality of image forming units based on the measurement data obtained by the measuring unit, thereby correcting color registration errors among a plurality of monochromatic images.